

Ecology Explorers 15! Series
Urban Ecology – Make Some Feedback!

Written by: Ecology Explorers Team

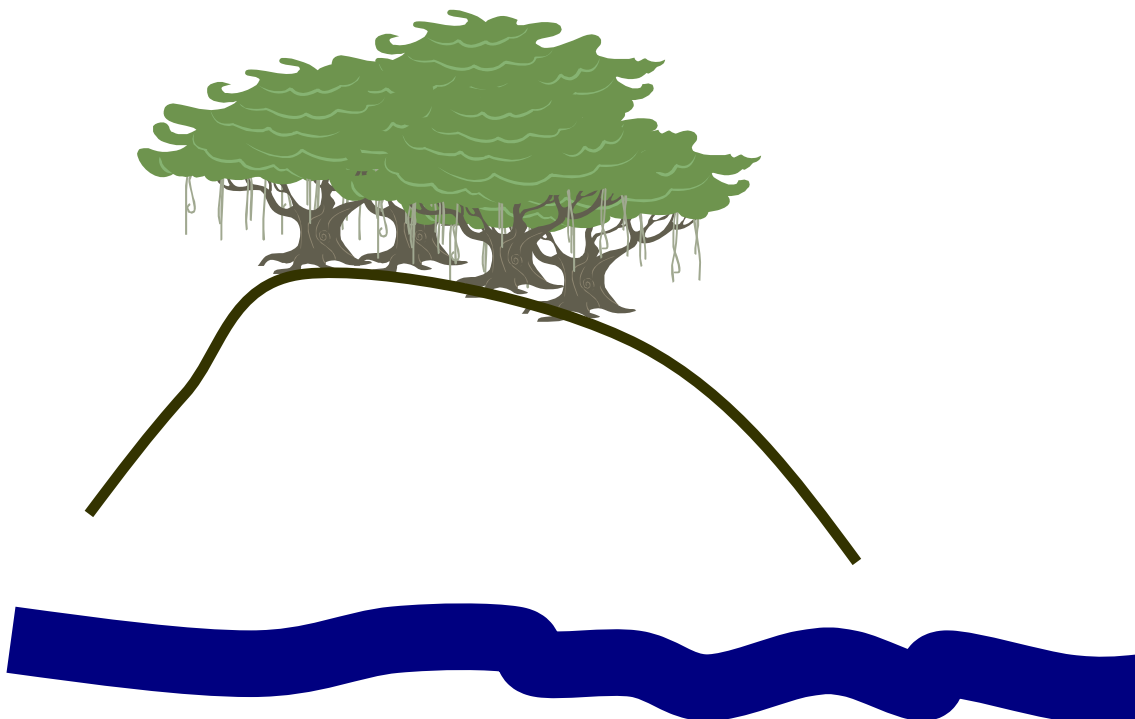
Adapted from data collected by ecoplexity.org members

Background Information for Instructor:

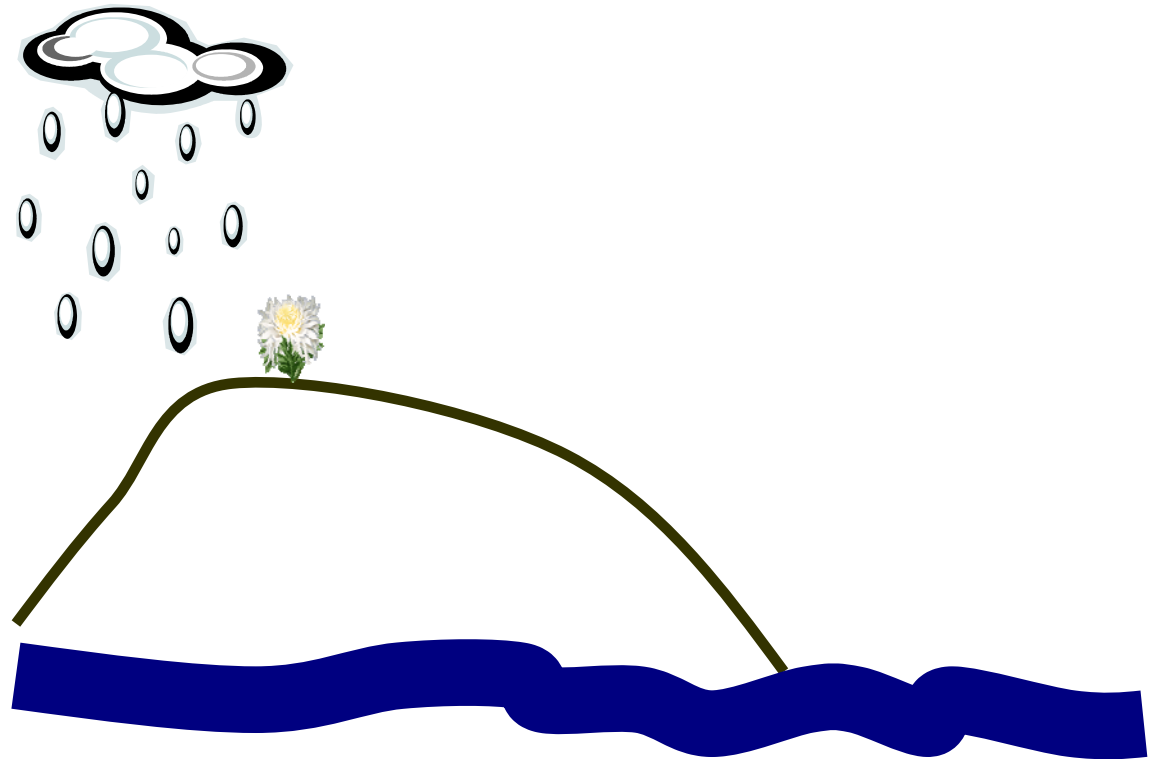
Ecoplexity is a site dedicated to providing various ecology focused resources to science teachers. This includes protocols, data, graphs, modeling platforms, and other educational materials. For example, the data used in this lesson was provided to Ecology Explorers by the Ecoplexity group (<http://ecoplexity.org/home>). Functional groups are ubiquitous components of all habitat types, at all scales and useful categorical tools. They are often employed to help develop hypotheses about complex ecological phenomena such as nutrient/mineral movement between the abiotic and biotic community.

Functional groups are created for every type of organism including bacteria, plants, and mammals. This lesson uses arthropod functional groups to explore and brainstorm potential causes leading to different functional group abundances (numbers) in different forest ages.

Here are a couple of diagrams to help you think about functional groups and systems:



Forest age, in this case old- versus young-growth, is an important consideration in terms of the type of ecological interactions predicted because age is often (though not always) associated with changes in species abundance and/or composition. For example, old-growth forests may have greater or fewer numbers of plants than a young-growth forest, resulting from and contributing to an increased organic layer in the soil. This could lead to increased complexity of the detritivore community feeding on the organic matter. In turn leading to increased nutrient availability to both plant and soil community members ultimately resulting in increased plant productivity and resources to herbivores and omnivores (Fig 1).



In the first diagram there are a lot of very old trees and in the second there is only one flowering shrub. How might these two habitats differ in terms of number and kinds of detritivores?

Another example of plausible differences in system correlated with forest age is: Increases in soil nutrients resulting from the above processes and reduced erosion, resulting from increases in plant cover, could alter the types and amounts of nutrients moving through stream systems present in old growth forest; add to this increased canopy cover and reduced evaporation of water from stream systems and one can begin to imagine the multifaceted consequences of forest age on water moving into and through the forest.

Looking again at the above diagrams, which one would you predict to have more soil eroding from the hill, the one with the thick stand of old trees, or the one with the flowering shrub?

Young growth forests are dominant throughout the world now due to human needs for the basic resource of wood (this is a deliberately simplified example of human impacts on forests). Many urban environments are surrounded by young forests continually harvested for resources such as wood. This proximity between large forest tracks adjacent to urban areas as well as forest remnants within urban areas leads to feedbacks between the two habitat types. It is these feedbacks that long-term ecologists are researching as part of Long-term Ecological Research Networks (<http://www.lternet.edu/>).

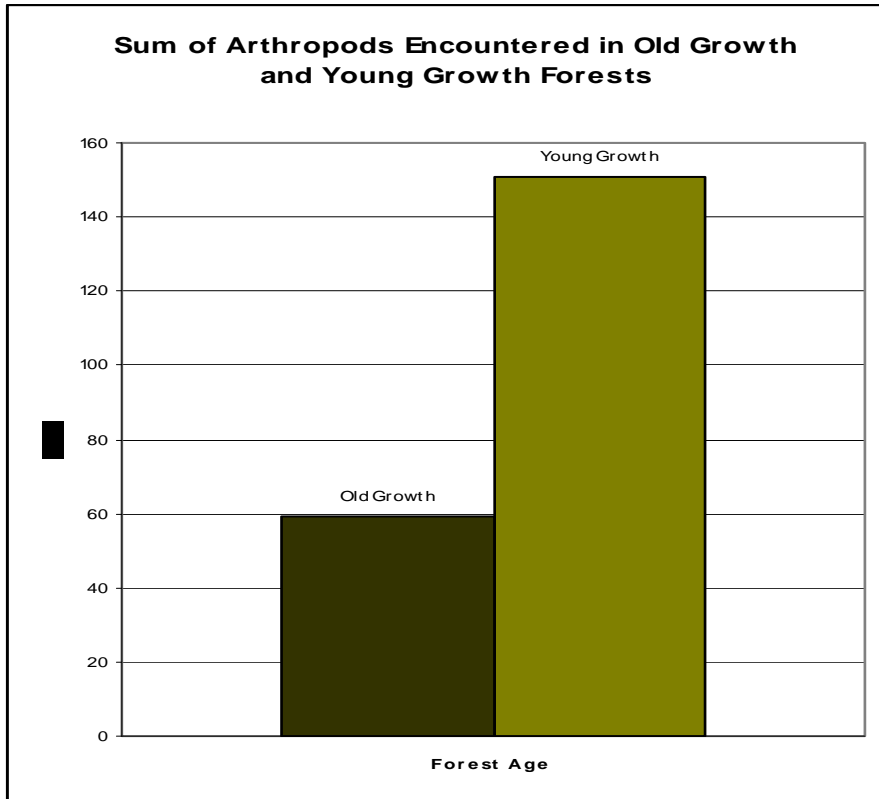
Arthropod functional groups much like animal functional groups are based primarily on feeding habits. The groups used here are:

1. Detritivores: feed on detritus or decaying/dead matter such as dead leaves and insects
2. Fungivores: feed on fungus
3. Algivores: feed on algae
4. Herbivores: feed on plants (herbs)
5. Predators: feed on other arthropods or animals
6. Omnivores: feed on just about everything

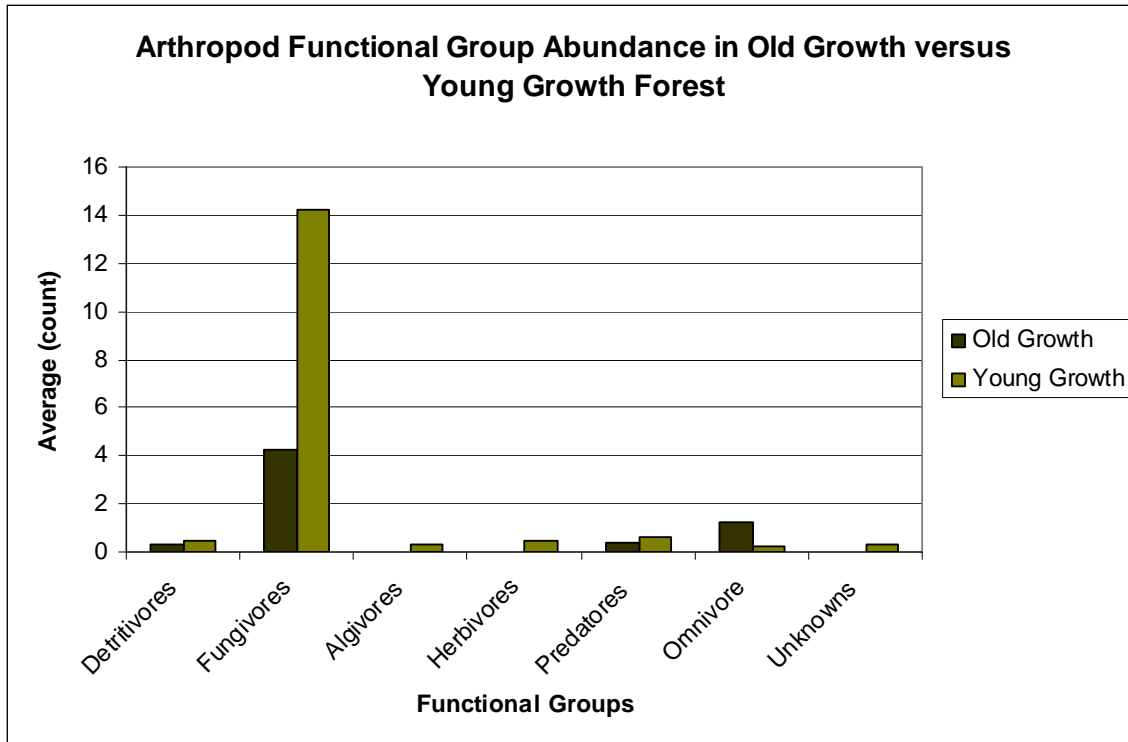
Plant functional groups are based on what is called the plant's *habit*, meaning how it grows. So plants are classified in this lesson as:

1. Ferns
2. Herbs (not having woody tissues, may be perennial or annual, typically low to ground)
3. Vine (typically elongate in structure, may produce wood-like tissues that support the plant or may rely on other plants or walls for support, doesn't produce true wood)
4. Shrub (may produce wood, doesn't reach canopy height, has more spreading (horizontal rather than vertical) growth pattern)

Lesson's Graphs:



Graph 1. Total number of arthropods (abundance) trapped in old- and young-growth forests.



Graph 2. Average number of arthropod functional groups found in old- versus young-growth forests.

Question examples:

1. First, look at Graph 1: which forest age has the most number of arthropods? _____
2. Then look at Graph 2: which forest age has the most number of functional group? _____
3. How many functional groups are present in the old-growth versus young-growth forest? _____
4. How does the number of functional groups (Graph 2) compare with the number of arthropods (Graph 1) among the two forest types? _____
5. List three more attributes (characteristics) in the forest that might contribute to this pattern (we've given you two):
 - a. fewer trees for birds to nest in
 - b. more sunlight hitting the forest floor

6. Which of these components do you think is most likely to explain the patterns you found and why?

7. Create an experiment you can use to test the hypothesis you presented in #4.
